DUKANE

Intelligent Assembly Solutions

iQ Series

ULTRASONIC HAND HELD SYSTEMS

HP

AUTOMATED | **HAND PROBE** | PRESS

User's Manual

Dukane Part No. 403–577–01

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This ultrasonic equipment is manufactured under one or more of the following U.S. Patents:
3,780,926 3,825,481 4,131,505 4,277,710 5,798,599 5,880,580 6,984,921, 7,225,965, and 7,475,801

Revision History

Revision Number	Revision Summary	Date
- 00	Original release.	08/01/2008
- 01	Add 20kHz and 30kHz models. Update Pop-up Fault Status Screens. Add Trigger by Power feature. Add Options section.	11/12/2009

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Contents

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SECTION 1

Introduction

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General User Information

Read This Manual First

Before operating your ultrasonic system, read this User's Manual to become familiar with the equipment. This will ensure correct and safe operation. The manual is organized to allow you to learn how to safely operate this generator. The examples given are chosen for their simplicity to illustrate basic operation concepts.

Notes, Cautions and Warnings

Throughout this manual we use NOTES to provide information that is important for the successful application and understanding of the product. A NOTE block is shown to the right.

In addition, we use special notices to make you aware of safety considerations. These are the CAUTION and WARNING blocks as shown here. They represent increasing levels of important information. These statements help you to identify and avoid hazards and recognize the consequences. One of three different symbols also accompany the CAUTION and WARNING blocks to indicate whether the notice pertains to a condition or practice, an electrical safety issue or a operator protection issue.

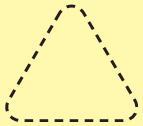
Drawings and Tables

The figures and tables are identified by the section number followed by a sequence number. The sequence number begins with one in each section. The figures and tables are numbered separately. The figures use Arabic sequence numbers (e.g. –1, –2, –3) while the tables use roman sequence numerals (e.g. –I, –II, –III). As an example, Figure 3–2 would be the second illustration in section three while Table 3–II would be the second table in section three.

NOTE

Note statements provide additional information or highlight procedures.

CAUTION



Caution statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING

Warning statements point out conditions or practices that could result in personal injury or loss of life.

Condition or Practice

Electrical Hazard

Hearing Protection

System Overview

Your ***iQ Series*** *Ultrasonic Hand Held System* has two basic components: an ultrasonic generator, and a hand probe.

Generator

The generator is specifically designed for ultrasonic applications using hand held probes. Using the available system control inputs and outputs, the generator provides a versatile stand-alone workstation.

This product's rugged internal circuitry ensures a continuous resonant frequency lock at the start of each weld.

Standard to this line of generators is time and energy control. The brightly lit display is easy to read. The menu structure makes programming simple, and the one-touch hot keys give the operator even more flexibility.

The generator's compact size and its integrated hand grip make it easy to carry.

It also includes an RFI line filter that passes strict CE test specifications for global applications.

Hand Probes

The probes are perfect for manual spot welding, staking, cutting and inserting applications. Both the HP and PG (pistol grip) models include hangers so that when a probe is not needed it can be hung on a counterbalanced hook. Fittings for air-cooling are also standard on all probes.

Key Features

- **Compact Generator** means this component is easy to move, and there will be more space for other necessities on the table or work bench.
- **Pulse Width Modulation** incorporates patented circuitry giving the power supply the ability to efficiently change the output amplitude. This makes it possible to start large horns with reduced power. It also provides more power efficient switch-mode generator operation and increased reliability.
- **Linear Ramp Soft Start** circuitry allows the acoustic stack to ramp up to operating amplitude smoothly, minimizing the start-up surges and abnormal stress to the stack and generator.
- **Digi-Trac Tuning** tracks the resonant frequency of the acoustic stack (horn, booster, transducer) and adjusts the generator output frequency to match it. This is done for every weld cycle and eliminates the need to manually tune the generator.
- **Line Voltage Regulation** automatically maintains constant amplitude regardless of line voltage deviation. The available output power is maintained with any voltage input within the specified range. This provides consistent system performance regardless of line voltage fluctuations. It also eliminates the need for bulky, external constant–voltage transformers.
- **Load Regulation** provides constant amplitude automatically regardless of power draw. The ultrasonic output amplitude level is held to within ±1% to provide weld process consistency and reduced weld cycle times.
- **Industrial Line–Power Source** means that standard systems will operate worldwide at all industrial high line voltage levels, whether it is 200VAC @60Hz in Japan, 240VAC @50Hz in Europe or 208VAC @60Hz in the United States. There are no internal transformer taps to change for worldwide operation. North American systems are optionally available to operate on the 120VAC line voltage level.
- **Multiple Electronic Overload** protection circuits prevent instantaneous component failure in the event of extreme output overload conditions, and rated overload power limit is based on the actual true RMS power output level.
- **Trigger by Power** produces greater weld consistency by requiring that a sufficient amont of pressure/force is applied to the part before the actual weld begins.
- **CE Certification** means that the system meets the required European standards to be sold and used in Europe.
- **ISO 9001 Certification** means that this system has been manufactured to high quality standards and assures you of manufacturing excellence.

SECTION 2

Health and Safety

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General Considerations

Please observe these health and safety recommendations for safe, efficient, and injury-free operation of your equipment. In this manual, the term *system* refers to a complete group of components associated with the welding of plastic or metal parts, also known as an ultrasonic assembly system. A typical system consists of a generator and/or ultrasonic process controller, start and stop switches, power controls, connecting cables, and the probe assembly which includes the transducer, booster, horn and replaceable horn tip.

Proper Installation - Operate system components only after they are properly installed and checked.

No Unauthorized Modifications - Do not modify your system in any way unless authorized to do so by the manufacturer. Unauthorized modifications may cause injury to the operator and/or equipment damage. In addition, unauthorized modifications will void the equipment warranty.

Keep the Cover On - Do not remove any equipment cover unless specifically directed to do so by the manufacturer. The generator produces hazardous electrical voltages which could cause injury.

Grounded Electrical Power - Operate this equipment only with a properly grounded electrical connection.

(See Page 11 for grounding information.)

Comply with Regulations - You may be required to add accessories to bring the system into compliance with applicable OSHA regulations for noise exposure.

Plastics Health Notice

Before using any ultrasonic welding system, be sure you are familiar with OSHA regulations from the U.S. Department of Labor about the particular type of plastic(s) you are using.

When plastic materials are being processed, they may emit fumes and/or gases that could be hazardous. Make sure you have adequate ventilation whenever these plastics are processed.

IMPORTANT

Never operate the generator with the cover off. This is an unsafe practice and may cause injury.

CAUTION

Parts being joined ultrasonically sometimes vibrate at audible frequencies. Wear ear protection to reduce annoying or uncomfortable sounds. In addition, sound absorbing materials, enclosures or sound deflectors may be installed to reduce the noise level.

Electrical Safety

Domestic Power Grounding

For safety, the power cords used on this product have a three-wire, grounding-type power cord. Figures 2-1 and 2-2 illustrate the appropriate electrical outlet to use with the power cords included with 100-120 volt and 200-240 volt systems respectively. This information applies to systems shipped to North America or Japan.

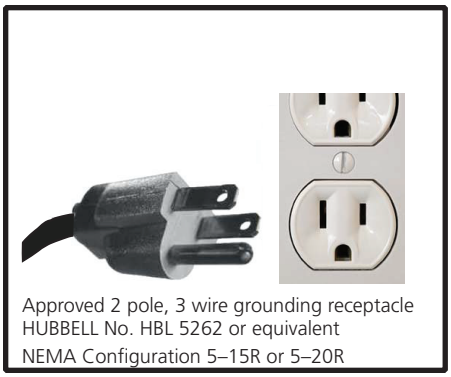

Figure 2–1 Example of 125 Volt, Grounded, 3-Prong Plug and Receptacle

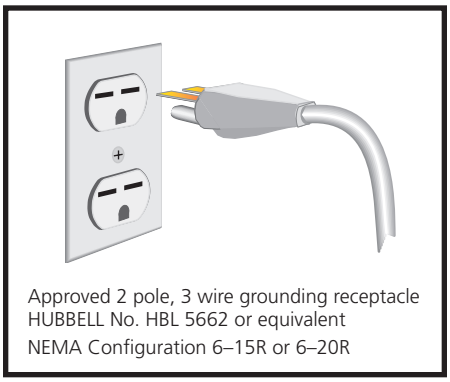

Figure 2–2 Example of 250 Volt, Grounded, 3-Prong Receptacle

International Power Grounding

The power cable normally provided for international use is compatible with the power outlet used in many Continental European countries. Refer to Figure 2–3. However, if your application requires another type of power cord, check with your equipment supplier, and follow local regulations concerning proper wiring and grounding.

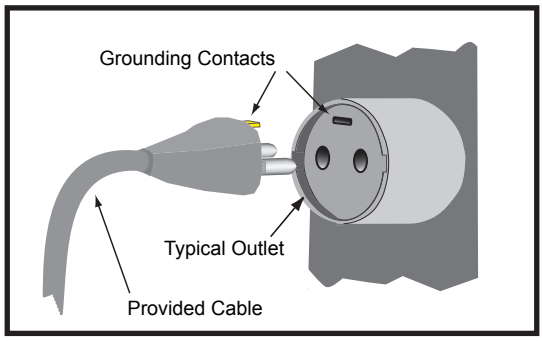

Figure 2–3 International 220/240V Grounding

CAUTION

If you have a two-prong electrical receptacle, we strongly recommend that you replace it with a properly grounded three-prong type. Have a qualified electrician replace it following the National Electric Code and any local codes and ordinances that apply.

See Figures 2–1 and 2–2.

CAUTION

If there is any question about the grounding of your receptacle, have it checked by a qualified electrician. Do not cut off the power cord grounding prong, or alter the plug in any way. If an extension cord is needed, use a three-wire cord that is in good condition. The cord should have an adequate power rating to do the job safely. It must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.

SECTION 3

Installation

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Unpacking

Carefully open your shipping container, and make sure it contains the items shown on the shipping documents. Inspect all items, and report any missing items or damage immediately.

Placing

Make certain generator placement and cable routing do not interfere with normal operation. Maintain easy access to your equipment.

The operator should have unobstructed access to cables and wiring.

RFI Grounding

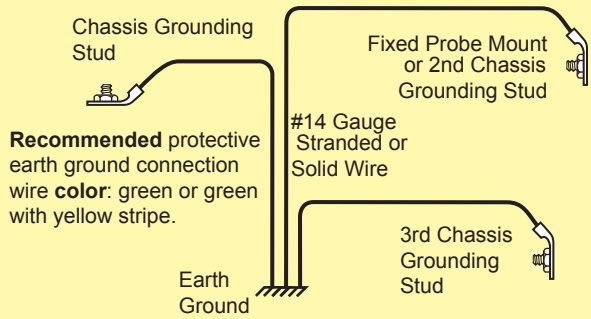
Proper grounding for the generator chassis is essential for the effective suppression of electrical noise or RFI (Radio Frequency Interference). Every ultrasonic generator contains a RFI filter that blocks noise on the AC power line from entering the system control circuitry. This filter also prevents ultrasonic frequency noise from being fed back into the AC power line. For the RFI filter to operate effectively, it is necessary to correctly ground the system.

Connect a grounding wire from the grounding stud connection (see Figure 3-1) to the nearest grounded metal pipe or equivalent earth ground.

See *Connecting Cables* on the next page.

CAUTION

To minimize electrical noise and eliminate ground currents, ground the chassis as shown. Use a STAR configuration (illustrated below). Do not DAISY CHAIN the grounds.



NOTE

Chassis Grounding Stud

The chassis grounding stud is used to attach a protective earth ground to the generator. This will aid in the suppression of electrical interference or radio frequency interference (RFI) that is common in a industrial environment. Stud location is shown in Figure 3-1 on the following page.

CAUTION

If you have any questions about the grounding of your equipment and/or the electrical box, contact a qualified electrician.

Connecting Cables - Quick Start Guide

Complete the basic connections as shown below:

- AC Line Input
- HAND PROBE Connector
- Grounding Stud
- AC Power Cord Connection

Step 1. Attach the female end of the power cord (200/240V only) to the generator's power inlet connector - Ⓐ in Figure 3-1.

(*The 100/120V model's power cord is permanently attached to the unit.*)

Step 2. Attach the hand probe's cable connector to the generator's HAND PROBE connection. - Ⓑ in Figure 3-1. Secure the connector to the system using the two jack screws attached to the connector hood.

Step 3. Ground the generator chassis with a user–supplied 14-Gauge wire. Attach one end to the grounding stud - Ⓒ in Figure 3-1. Attach the other end to the nearest grounded metal pipe or equal earth ground.

Step 4. Attach the male end of the power cord to a suitable line receptacle.

Optional Connections - See Page 14 for information about the rear panel OUTPUTS connector.

NOTE

AC Power Inlet

Depending on your generator model, line voltage required for the generator is either 100-120 VAC at 50/60 Hertz ***or*** 200-240 VAC at 50/60 Hertz.

The unit has a power switch, and is powered ON whenever the AC line power is live and the switch is in the ON position as shown in Figure 3-2 below.

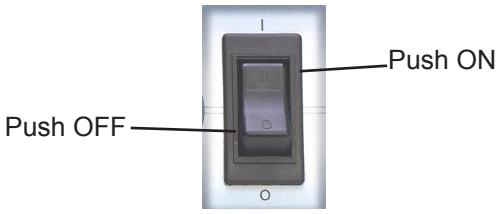


Figure 3-2 Rocker-style Power Switch/Circuit Breaker

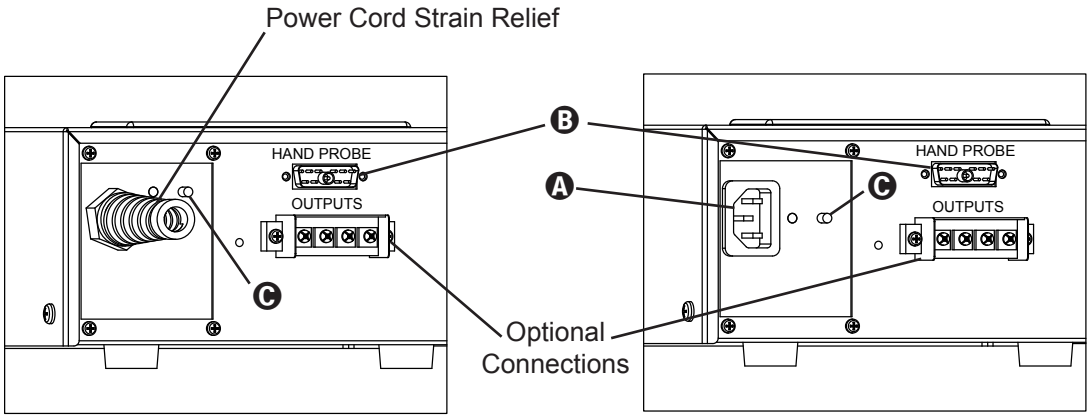


Figure 3-1 Generator Detail - Rear Views

Power Cords

200/240 Volt Systems

The IEC AC power inlet connector mounted on the rear panel requires a properly configured IEC compliant power cord.

The 200/240 AC power cords supplied with the generators are matched to the ultrasonic output power rating and the continent of specified use. See Table 3-I.

Continent of Use	Power Cord Part Number	Power
North America	200 - 1541	240V, 10A
Europe	200 - 1542	240V, 10A
India	200 - 1624	240V, 10A

Table 3-I Standard IEC AC Power Cord Part Numbers

100/120 Volt Systems (North America or Japan)

The power cord (including strain relief) supplied with the 100/120 AC systems is permanently attached to the rear of the generator. Units with this power cord are for use in North America or Japan.

HAND PROBE Connector

Ultrasound Output

The ultrasound output connector used with this generator is integrated into a D-Sub style connector. This connector provides superior shielding of electrical noise. The output connector mates with a fully shielded ultrasound cable that is secured to the generator with two simple, reliable thumbscrews.

The ultrasonic output from this connector (that drives the attached ultrasonic load) is a very high AC voltage. At high power levels there is high current, and the cable must be securely attached to the hand probe for safe operation. Only use original equipment ultrasound cables for safe and reliable system operation.

System Outputs (Optional Connections)

The OUTPUTS connector is a four-position wire receptacle-type terminal block. If needed, it can provide the operator with basic system welding status. *Everything connected to the OUTPUTS connector is customer-supplied.* Typically indicator lights or sound modules are powered by these output signals. (The lights or sound modules can be mounted on widely available Stack Light assemblies.) Each output signal is rated to operate on a 24VDC power source and can activate an attached load up to a maximum of 500 mA.

Table 3-II lists the signal names.

Pin	Signal Name
0V	Output Common
1	End of Weld Alarm
2	Any Fault Alarm
3	Bad Part

Table 3-II System OUTPUTS Connector Signals

NOTE

All outupt signals are non-isolated and sink current to chassis ground when activated.

Pin 0V (Output Common)

Pin 0V is connected to chassis ground.

Pin 1 (End of Weld Alarm)

Non-isolated NPN output that sinks current at the End of Weld cycle. It activates when ultrasound switches off, or at the end of a preset Hold period. The signal lasts for one second, then deactivates.

Pin 2 (Any Fault Alarm)

Pin 2 is a non-isolated digital NPN status output that sinks current to chassis ground if any fault condition is sensed. This output is active until the start of the next cycle or until ENTER is pressed if in non-latching fault mode.
In latching fault mode the user must press ENTER to clear this output.
If a hardware fault like Over Temperature or a power fault occurs, Any Fault is active until the fault is cleared in non-latching fault mode. In latching fault mode, the user must press ENTER to clear this output. However if the fault persists, pressing ENTER has no effect.

Pin 3 (Bad Part)

Pin 3 is a non-isolated digital NPN status output that sinks current to chassis ground if a Bad Part is detected. This output is active until the start of the next cycle or until ENTER is pressed if in a non-latching fault mode. It is active until ENTER is pressed if in a latching fault mode.

NOTE

Refer to Figure 9-1, OUTPUTS Interface Example, Page 65.

SECTION 4

Controls

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Front Panel Overview

This section gives an overview of the front panel functions: powering the generator on/off; monitoring the process with the display; and, programming with the control keys.

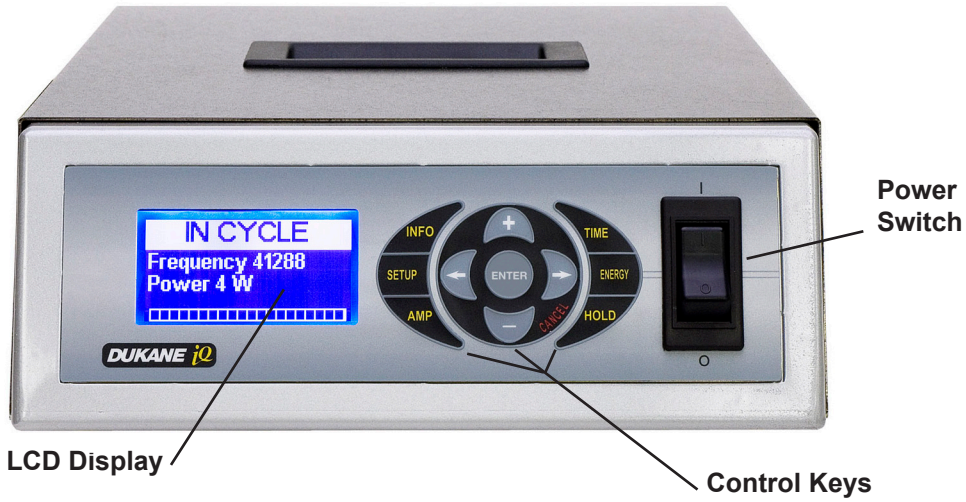

Figure 4-1 Front Panel

Power Switch/Circuit Breaker

The power switch/circuit breaker has a rocker-style actuator switch that will activate or deactivate the AC power to the system. The power ON position is marked with the internationally recognized I symbol, the power OFF position is marked with the 0 symbol. This power switch also integrates an appropriately sized over-current protection circuit breaker function in the generator.

If an over-current condition trips the circuit breaker, it will automatically switch to the OFF position. If the overload current that caused the circuit breaker to trip is due to a transient condition, the circuit breaker can be reset by switching the actuator back to the ON position.

CAUTION

If when resetting the circuit breaker afer it has tripped, it immediately trips again, there is likely an internal system malfunction, and the generator will need service. Do NOT repeatedly try to reset the circuit breaker. If it trips, this will only cause more damage to the generator.

Control Keys

The control keys shown in Figure 4-1 and described below, are used to display information, and to program the generator.

INFO

Press this key to get system information or to modify the hardware settings.

System Information - Identifies the current version of system software.

Hardware Settings - Select features that can be turned on or off including the Audible Alarm or Fault Latching options.

SETUP

Use the SETUP key to Load, Store, or Delete as many as eight setups.

Continued

Control Keys *Continued*

AMP
Set the ultrasound amplitude output level in the range of 20 to 100%.
Typically amplitude is set to 100%.

TIME
Use this key to select time as the primary method of welding. Set the weld time (seconds).

ENERGY
Use this key to select energy as the primary method of welding. Set the weld energy (joules).

HOLD
Hold is a time period beginning after the weld portion of the cycle is complete. The operator holds the probe in place applying pressure to the weld, and an audible alarm indicates that the Hold time is finished. Hold can be set to a maximum of 5.0 seconds.

ENTER
Press the ENTER key to select a menu item, and move to the next level of the menu. Think of it as a "forward" key. When pressed, it also confirms and stores a selection in memory. It is also used to reset a latched condition.

Arrow Keys
Press the right and left arrow keys to move the cursor to the right or left.

+ and - Keys
Press these keys to increase or decrease the value of a selected digit.

CANCEL
Press CANCEL to return to the previous screen. Think of it as a "back" key. Press this key when you do not want to store the selection in memory.

System LCD Display
This high resolution, multi-line display provides a clear graphic interface to the operate and in-cycle screens needed to monitor and program the system.

Power Bar Graph
The Power Bar Graph appears at the bottom of the LCD display. It contains 20 segments that represent the generator's range of power from 0% at the far left of the bar graph to 100% of power at the far right. Each segment equals 5% of the total.

In the example below, 40% of the available power is used during the weld cycle. The display shows an In Cycle screen (while U/S is active).

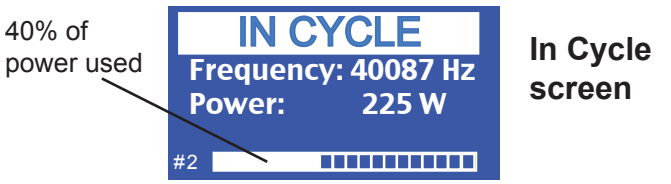

Figure 4-1A Power Bar Graph - In Cycle

In the example below, 40% of the generator power was the maximum (peak) power delivered in the previous weld. The display shows an Operate screen (while U/S is inactive).

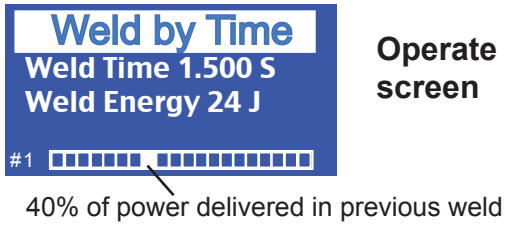

Figure 4-1B Power Bar Graph - Operate

CAUTION

Make sure the stack is properly assembled before it is connected to the system. The horn should never come in direct contact with a metal fixture or anvil when ultrasound is activated.

Start-up Sequence

After all connections have been completed.

1. Push the Power Switch to ON (Figure 4-2).

   The generator performs a self-diagnostics sequence.

2. The Power-up screen appears briefly - Figure 4-3.

3. The next screen is an Operate screen ready for a new weld to be done. The display shows:

   The setup used for the last weld, and zeros for any weld parameters.

   See Figure 4-3A.

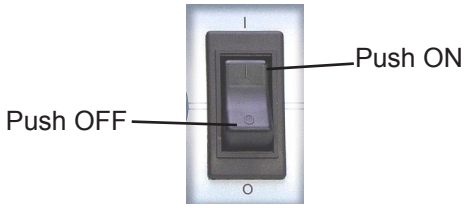

Figure 4-2 Power Switch

Figure 4-3 Power-up Screen

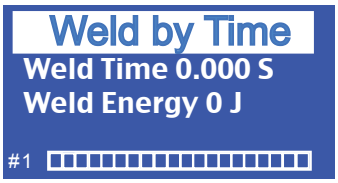

Figure 4-3A Operate Screen Appears After Power-up

Starting a Weld Cycle

1. If the generator is not powered, press its Power Switch/Circuit Breaker to the ON position.
2. Select the setup you want to use, if appropriate.
3. Apply the probe tip to the components to be ultrasonically joined, and press the hand probe's trigger switch to activate ultrasound.
4. After meeting the weld parameters (and with the Hold time set to zero) - in either Manual, Time or Energy modes - an internal alarm beeps once after the weld setting is met, or after the trigger switch is released.

   Depending on optional customer OUTPUTS connections - System Outputs, Page 14 - external audible or visual alerts can be activated as well.

5. Release the probe's activation switch (trigger), and if appropriate, apply pressure while an optional Hold time elapses. The generator signals when that period is over by sounding an audible alert.

   The user can release the activation switch during the Hold time, but there will not be an audible beep until the preset Hold time ends.

Stopping a Weld Cycle

1. Release the hand probe's activation switch (trigger) to abort a weld cycle and stop ultrasound.
2. In addition, press the generator's Power Switch/ Circuit Breaker to the OFF position to power down the generator.

NOTE

The system will not beep as described here if the Audible Alarm is OFF.

See Hardware Settings, Page 27 to learn how to turn the Alarm ON or OFF.

LCD Display Overview

There are two basic kinds of screen displays:

Operate screens, and **In Cycle** screens.

An **Operate** screen tells the operator what happened in the last weld cycle.

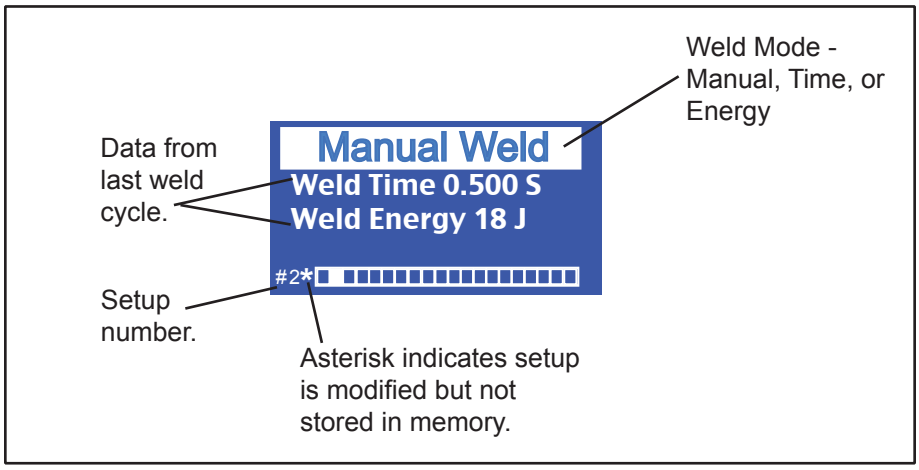

Figure 4-4 Example of an **Operate** Screen

An **In Cycle** screen activates when the probe activation switch (trigger) is pressed.

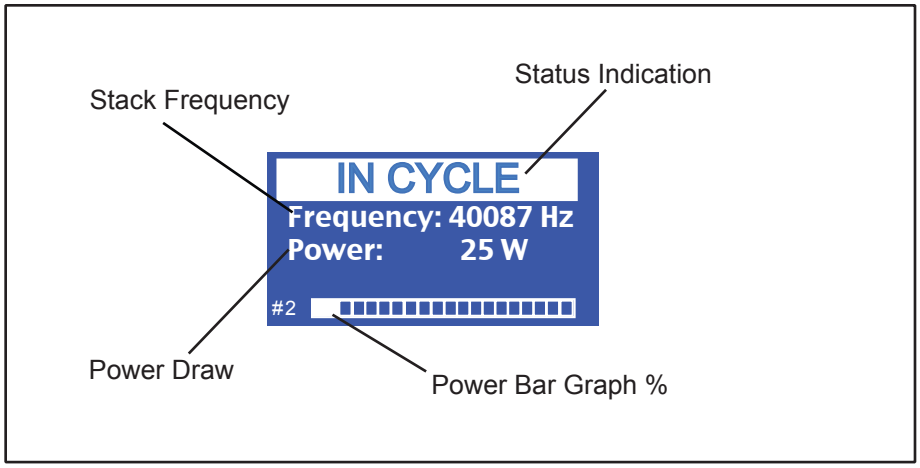

Figure 4-5 Example of an **In Cycle** Screen

SECTION 5

Process Control Settings

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Process Controller Settings

This section of the manual helps the reader become familiar with the operating modes, and illustrates some typical programming steps.

There are three welding modes available. These correspond to the three ways in which the welder can be used: Manual, Time, and Energy.

Select the Welding Mode

Manual - In MANUAL mode the operator controls the weld cycle. The cycle starts when the operator presses the hand probe's trigger switch, and the ultrasonic signal (U/S) activates. When the trigger switch is released, the ultrasonic signal stops, and the cycle is complete. (Manual mode is the default selection.)

Time - In TIME mode the operator sets a maximum time (seconds) the ultrasonic signal will be active for each weld cycle. The cycle starts when the hand probe's trigger switch is activated, and the U/S activates. The U/S stops when the programmed time is reached. The trigger switch must be held activated for the entire welding cycle. Then it is released so that a new weld cycle can begin.

Energy - In ENERGY mode the operator sets a maximum energy (Joules) the generator will reach during the weld cycle. [*A maximum weld time must be set when welding by energy. If the energy level is not reached, the preset for time will determine when the U/S is deactivated.*] When the preset energy level is reached, the U/S will be deactivated. The cycle starts when the hand probe's trigger switch is pressed, and U/S is activated. When the programmed energy is reached, U/S stops. The trigger switch must be held activated for the entire welding cycle. Then it is released so that a new weld cycle can begin.

NOTE

With one exception, U/S is activated anytime the probe's trigger switch trigger is pressed regardless of operating mode, or what is displayed on the LCD screen.
The EXCEPTION - When a fault has occurred in Latching Fault Mode. In that case ENTER must be pressed to clear the fault before U/S can be activated.

Navigating Through the Modes

When the generator is first powered up, the default operating mode is Manual, and **Manual Weld** is shown at the top of the display as shown in Figure 5-1.

Navigate to Time Mode

1. Follow the sequence shown in the figures to the right to navigate from Manual mode to Time mode.

   In Manual mode, press the TIME key (Figure 5-2).

2. The phrase, *Enter Changes Mode*, means when the ENTER key is pressed, the mode will change. So press the ENTER key, and the Weld by Time screen seen in Figure 5-3 appears.

3. Set the time.

   Use the ← → and the + - keys to move the cursor and to set the digits for the weld time you want.

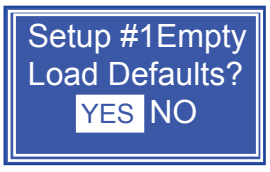
4. Press the ENTER key to accept the time that has been set (Figure 5-4).

   Press the CANCEL key if you decide not to set the time.

NOTE
Navigating to Manual Mode

Set Time or Energy (depending on mode) to OFF, and press ENTER.
This will put you back in Manual mode.

Alternately:
Find an empty setup. Press SETUP.
Press ENTER.
A pop-up screen about defaults appears.



Select YES to load the default operating mode which is Manual, and you can weld using the Manual mode.

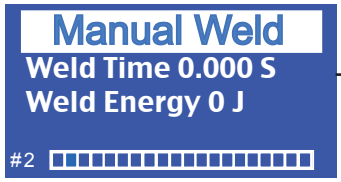


Figure 5-1 Manual Weld Mode

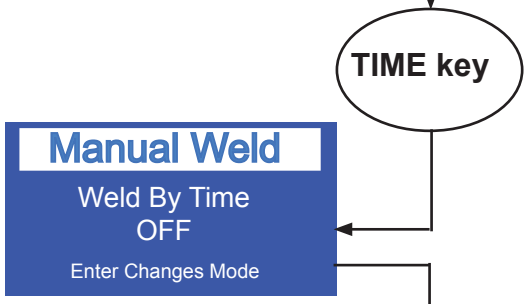


Figure 5-2 Navigate to Time Mode

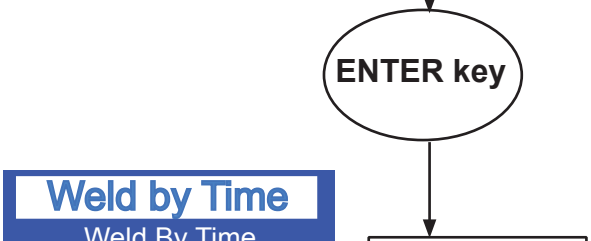


Figure 5-3 Time Weld Mode - 1

Figure 5-4 Time Weld Mode - 2

Navigate to Energy Mode

1. Follow the sequence shown in the figures to the right to navigate from Time mode to Energy mode.

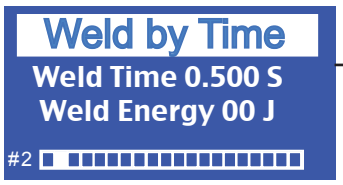


Figure 5-5 Time Weld Mode

In Time mode (Figure 5-5), press the ENERGY key, and the screen as shown in Figure 5-6 appears.

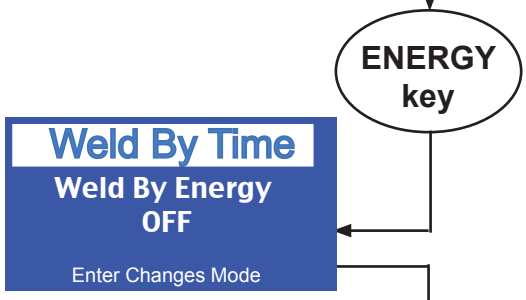


Figure 5-6 Navigate to Energy Mode - 1

2. The phrase, *Enter Changes Mode*, means when the ENTER key is pressed, the mode will change. So press the ENTER key, and the Weld by Energy screen seen in Figure 5-6A appears.

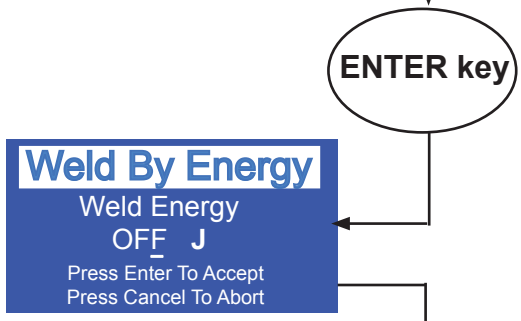


Figure 5-6A Navigate to Energy Mode - 2

3. Use the ← → and the + - keys to move the cursor and to set the digits for the energy you want. See Figure 5-7.
4. Press the ENTER key to accept the energy that has been set. Press the CANCEL key if you decide not to set the energy.
5. If you set the energy level, a maximum weld time needs to be set also. Set a time that is reasonable for your application. [The factory default for this time is 30 seconds (also the maximum).]

   The time can not be set below 0.001 second.

   Use the ← → and the + - keys to move the cursor and to set the digits for the time you want.

   See Figure 5-8.

Figure 5-7 Energy Weld Mode - 1

Figure 5-8 Energy Weld Mode - 2

Hold

HOLD is used more often with Time or Energy modes, but it can be used with the Manual mode. It is a period of time that can be set to follow release of the probe's trigger switch.

During HOLD the operator typically applies pressure to the part being welded. Next, the operator hears an audible alarm that serves as a reminder that HOLD has finished, and the probe can be lifted.

HOLD does not allow the operator to begin a new cycle until HOLD is finished.

To set a HOLD period:

1. Select the weld mode (Manual, Time, Energy).
2. Set the time and energy parameters as needed.
3. Press the HOLD key. The screen will appear as it does in Figure 5-9.
4. Set the time with the + - keys.

   (A maximum of 5.0 seconds.)

   Figure 5-9A shows a setting for 2.0 seconds.
5. Press the ENTER key to confirm your selection.

NOTE

The generator's end of HOLD signal will only be heard if the audible alarm is ON.
The Audible Alarm can be set ON or OFF. See Hardware Settings on the next page.

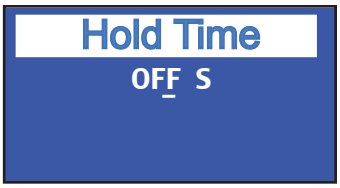


Figure 5-9 HOLDTime - 1

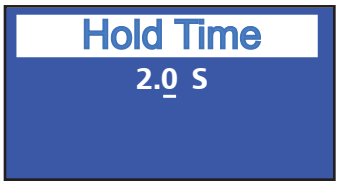


Figure 5-9A HOLDTime - 2

Amplitude Adjustment

Amplitude refers to the movement of the horn at its workface. The higher the amplitude setting, the higher the power output level will be at a particular pressure level.

Amplitude settings are given as a percent of the horn's nominal amplitude in the range of 20% to 100%.
It is typical to leave the amplitude setting at 100% for maximum power output.

To adjust amplitude:

1. Press the AMP key. The screen will appear as in Figure 5-10.
2. Set the amplitude level using the ← → keys and the + - keys.
3. Press ENTER to confirm your amplitude setting.

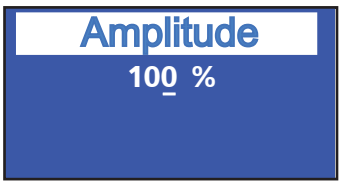


Figure 5-10 Amplitude

System Information, Hardware Settings, Advanced Settings

When the INFO key is pressed the display looks like Figure 5-11:

Using the + - keys, move the pointer to indicate:
System Information, Hardware Settings, or
Advanced Settings

Press ENTER to make the selection.

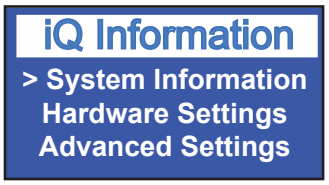


Figure 5-11 INFO Screen

1. System Information

Manufacturer's information is shown including the manufacturer's name, the name of the system (iQ 20kHz Hand Probe) and the software identification.

Figure 5-11A shows an example of this information.

Figure 5-11A System Information Example Screen

2. Hardware Settings

Figure 5-12 gives a view of the Hardware Settings screen.

Figure 5-12 Hardware Settings Screen

Audible Alarms - With the pointer as shown in Figure 5-12, the operator can turn the audible alarms on or off. Use the ← → keys to move from ON to OFF. The current selection is highlighted.

Latching Faults - Latching faults can be turned on or off.

If Latching Faults is on, and a fault occurs, the alarm sounds twice (beep, beep) indicating the generator is latched and it will not weld again until the fault is corrected.

Pressing ENTER clears the fault, and the next cycle can begin.

If Latching Faults is off, and a fault occurs, the audible alarm (beep, beep) will be heard, but welding can continue.

NOTE

Changes in Hardware Settings take place after ENTER is pressed.

Continued

3. **Advanced Settings** *Continued*

After Advanced Settings is selected, a warning screen is displayed as shown in Figure 5-13.

Adjusting these settings may affect the operation of your unit. Before you change a setting, please check with Dukane personnel for their recommendations.

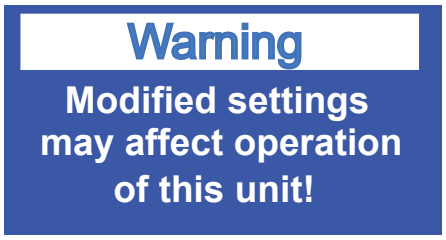


Figure 5-13 Warning Screen

The warning screen is shown for a few seconds, then, the Advanced Settings screen appears.

See Figure 5-14.

Adjustments can be made to: Free Run Frequency; Ramp Up Time; Frequency Lock and Hold; and, Trigger By Power, but note that Trigger by Power is only available when the weld mode is time or energy.

> **NOTE**
>
> Trigger by Power is only available when the weld mode is either Time or Energy.

Figure 5-14 Advanced Settings Screen

Free Run Frequency

Free run is the frequency at which the generator drives the ultrasound ouput pulses until a valid feedback signal is detected. Typically this value should be below the operating frequency of the probe.

Follow the on screen prompts to make setting adjustments.

Ramp Up Time

This parameter increases the amplitude linearly in the programmed time period at the start of the weld from zero to the programmed amplitude level. This brings the probe up to operating amplitude smoothly preventing shock stress.

Follow the on screen prompts to make setting adjustments.

Lock and Hold

For an explanation of Frequency Lock and Hold, please refer to Application Note 505 found on our website at:

http://www.dukane.com/us/DL_ApplData.asp

Follow the on screen prompts to make setting adjustments.

Continued

Advanced Settings *Continued*

Trigger by Power

For an explanation of Trigger by Power and the three settings that are connected with it, please refer to Application Note 506 found on our website at:

http://www.dukane.com/us/DL_ApplData.asp

When Trigger by Power is selected, three additional settings screens are presented:

- Trigger Amplitude;
- Trigger Power; and,
- Trigger Timeout

See Figures 5-15, 5-16, and 5-17 for previews of these screens

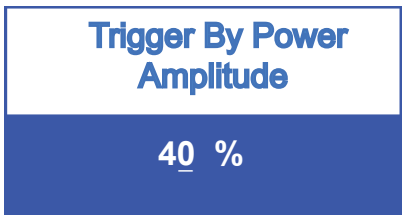


Figure 5-15 Trigger Amplitude

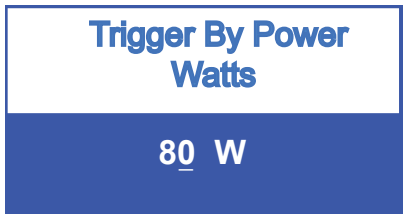


Figure 5-16 Trigger Watts

Figure 5-17 Trigger Timeout

Setup Maintenance

Introduction

The screens available in Setup Maintenance allow the operator to Load, Store, or Delete generator weld setups. As many as eight (8) setups can be loaded and stored for your convenience.

Navigating

1. When the SETUP key is pressed for the first time, the display looks like Figure 5-18. This screen indicates that Setup #1 is Empty. Because there is not yet any data available, this setup has nothing in it, and is empty. You will see that Load is highlighted.
   Press ENTER.
2. **Load** - (Load means to put data into the generator's memory, or to program a setup.)
   A pop-up screen asks if defaults should be loaded for Setup #1. See Figure 5-18A.
   Select NO, and the display will change to an Operate screen.
   Select YES, and Manual Weld shows at the top of the Operate screen that will display next. The setup number appears in the lower left corner of the screen. Refer to Figure 4-4.
3. After selecting YES, press SETUP, and the display will look like Figure 5-19.
4. **Store** - (Store means to save the setup data.)
   Tap the right arrow key once to highlight Store.
   See Figure 5-20.
5. Press ENTER, and a pop-up screen as shown in Figure 5-21 appears.
6. Select YES if you want to overwrite (replace) whatever is in the setup, and select NO if you do not want to change anything for that setup.
   Press the ENTER key to save your selection.
7. **Delete** -To delete the setup, select Delete as shown in Figure 5-22, and press the ENTER key. A pop-up screen appears to ask you to confirm your choice.
   Select YES or NO, and press ENTER again.

Continued

Figure 5-18 Setup Maintenance - 1

Figure 5-18A Pop-up Load Defaults?

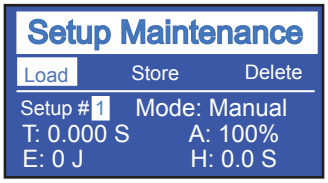


Figure 5-19 Setup Maintenance - 2

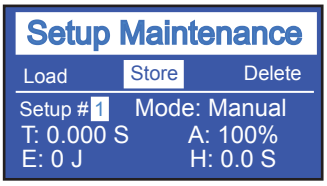


Figure 5-20 Setup Maintenance - 3

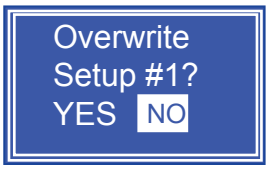


Figure 5-21 Pop-up Overwrite Setup?

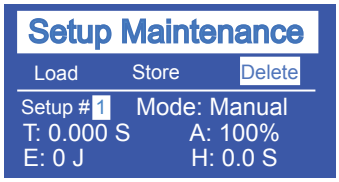


Figure 5-22 Setup Maintenance - 4

Setup Maintenance *Continued*

Saving the Current Setup

Try using your navigation skills on this example:

1. Follow instructions on Page 24 to set the mode to Weld by Time. Set the time to 1.520 seconds.

   See Figure 5-23.

2. Press SETUP and then press the **+** key until you get an Empty Setup Maintenance screen.

   See Figure 5-24.

3. Use the right arrow key to select Store, and then press ENTER. You will be returned to the Operate screen.

4. Confirm that your setup has been stored in memory by going back to SETUP. Your new setup should appear, just as it does in Figure 5-25.

Selecting a Setup

To select a setup previously stored:

1. Press SETUP.
2. With Load highlighted, use the **+** **-** keys to select the number of the setup you want.
3. Press ENTER.
4. The Operate screen will display this selection as a number in the lower left hand corner.

Deleting a Setup

To delete a setup previously stored:

1. Press SETUP.
2. With Delete highlighted, use the **+** **-** keys to select the number of the setup you want.
3. Press ENTER, and a pop-up screen will ask you to confirm your selection. Make your choice, and press ENTER.
4. Check that the setup is deleted. Press SETUP, and the Setup Maintenance screen will show EMPTY for the setup you just deleted.

Figure 5-23 Save Current Setup

Figure 5-24 Store in Setup Maintenance

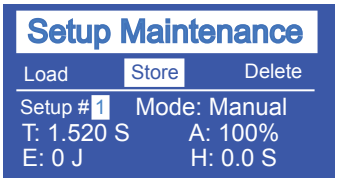


Figure 5-25 New Setup Stored

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SECTION 6

Probes and Probe Stacks

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Ultrasonic Probe Overview

The two types of probes used with the iQ Hand Held Systems are shown in Figure 6-1 below.

Operating Notes

Compressed Air Fitting - In continuous duty operation, it is important to keep the probe cool with compressed air. Use the air fitting to connect the air source to the probe.

See Section 7, Specifications for more detail.

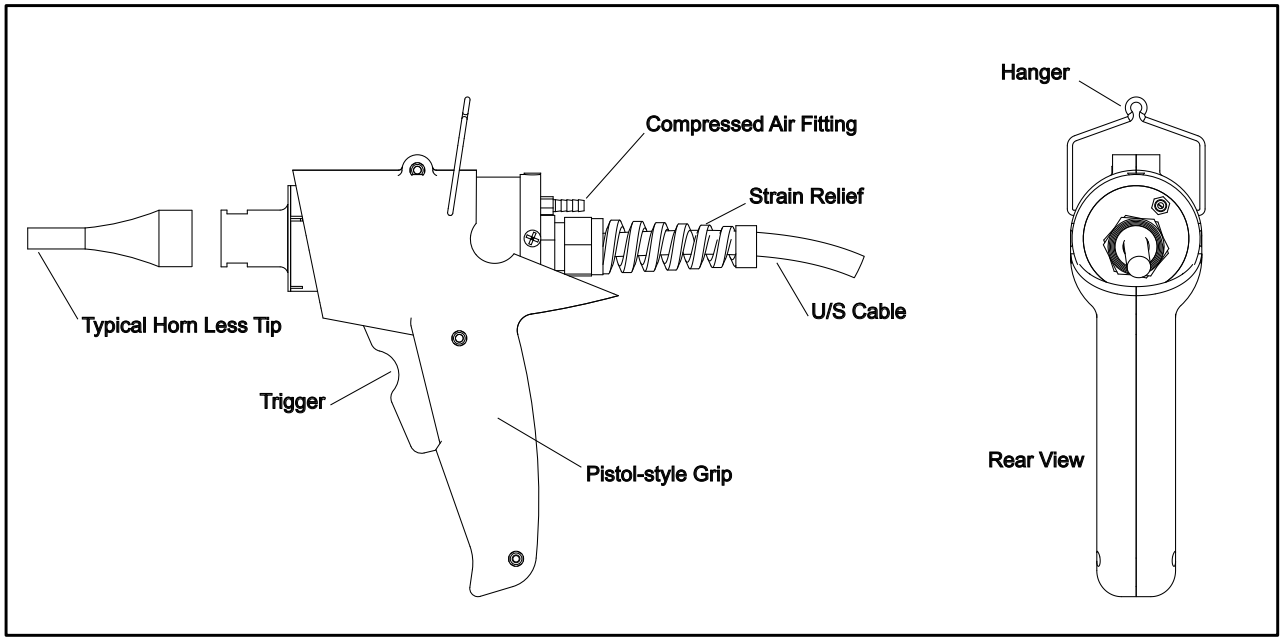
CAUTION

The ultrasonic cable carries high electrical current when in operation. Do not nick or cut this cable. If cut, there would be a high potential for electric shock!

NOTE

Compressed air supply: Make sure the air is clean, oil-free, and dry.

Models 41PG40 & 41PG40S



Models 41HP40 & 41HP40S

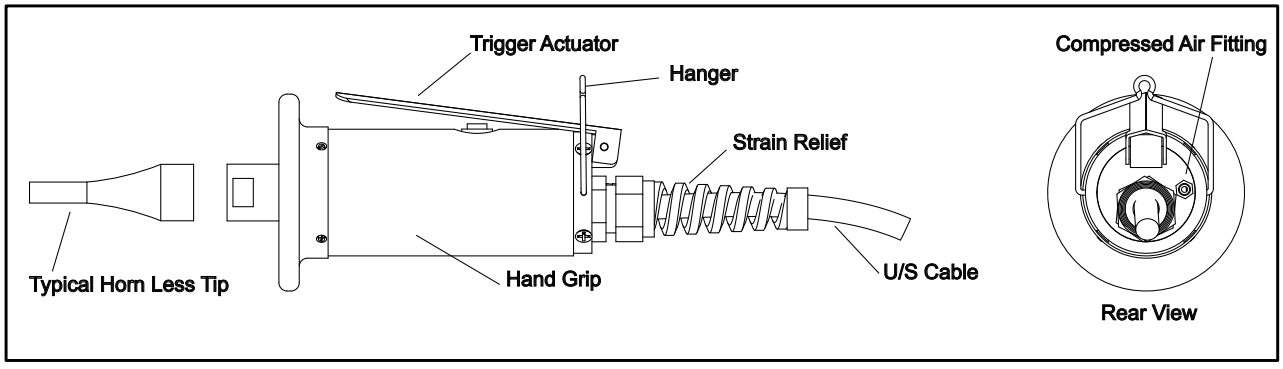


Figure 6-1 Typical Hand Held Probes

Theory of Operation

Plastic welding is the most common application of ultrasonic assembly. To perform ultrasonic plastic welding, the vibrating tip is brought into contact with one of the work pieces. Pressure is applied and ultrasonic energy travels through the material generating frictional heat at the contact point of the two parts. The frictional heat melts a molded ridge of plastic on one of the pieces and the molten material flows between the two surfaces. When the vibration stops, the material solidifies forming a permanent bond.

Probe Configuration

A basic ultrasonic probe package consists of:

1. A probe which houses the transducer to convert the electrical energy supplied by the generator into mechanical vibrations.
2. A horn to transfer the mechanical vibrations from the probe to the parts to be welded.

Optional components include special replaceable tips which can be threaded on to the tip of the horn, and a booster to amplify the mechanical vibrations of the horn. A basic hand–held probe system is shown in Figure 6-2. The hand probe is easily identified by its trigger actuator and permanently attached cable. Normally a booster is not used with a hand probe as this increases the length and weight and reduces its versatility. The optional threaded titanium tip can be used when the application calls for a staking profile or a pointed spot weld. Replaceable tips are not commonly used in high–volume production environments.

CAUTION

Never use the hand probe if the cable insulating jacket is cut or damaged in any way.

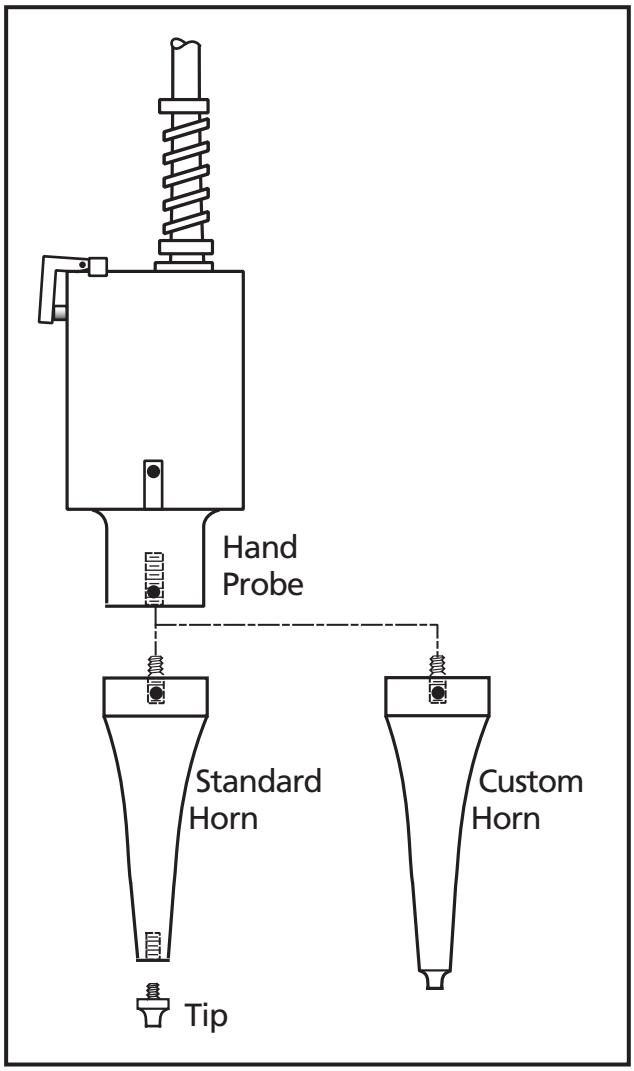


Figure 6–2 Hand Probe, Horn and Tip

Ultrasonic Horn

The horn transfers the ultrasonic mechanical vibrations (originating at the transducer in the probe housing) to the plastic parts through direct physical contact. The horn is precision machined and designed to vibrate at either 20kHz, 30kHz, 40kHz, 50kHz or 70kHz. The tuning is accomplished using electronic frequency measurement. Inherent variations in material composition prevent tuning by dimensional machining alone.

There are many different horn profile styles depending upon the process requirements. Factors which affect the horn design are the materials to be welded and the method of assembly. Horns are usually constructed from aluminum, hardened steel or titanium. As the frequency increases, vibration amplitude typically decreases, but internal stress in the horn increases. Higher frequencies are used for delicate parts that cannot handle a lot of amplitude. Some factors to keep in mind for high–frequency (e.g. 40kHz) ultrasonic welding versus low–frequency (e.g. 20kHz) ultrasonic welding are listed here.

1. Stress in the horn is higher at high frequencies.
2. Wear on the horn is greater at high frequencies.
3. Clean and flat mating surfaces between the horn, booster and transducer are more critical at high frequencies.

Booster

The function of a booster is to alter the gain (i.e. output amplitude) of the probe. A booster is amplifying if its gain is greater than one and reducing if its gain is less than one. A neutral or coupling booster is used to provide an additional clamping location for added probe stack stability. A probe designed to be mounted in a fixture along with a booster and horn is shown in Figure 6–3. This is commonly referred to as a stack. As indicated, the components are secured with threaded studs.

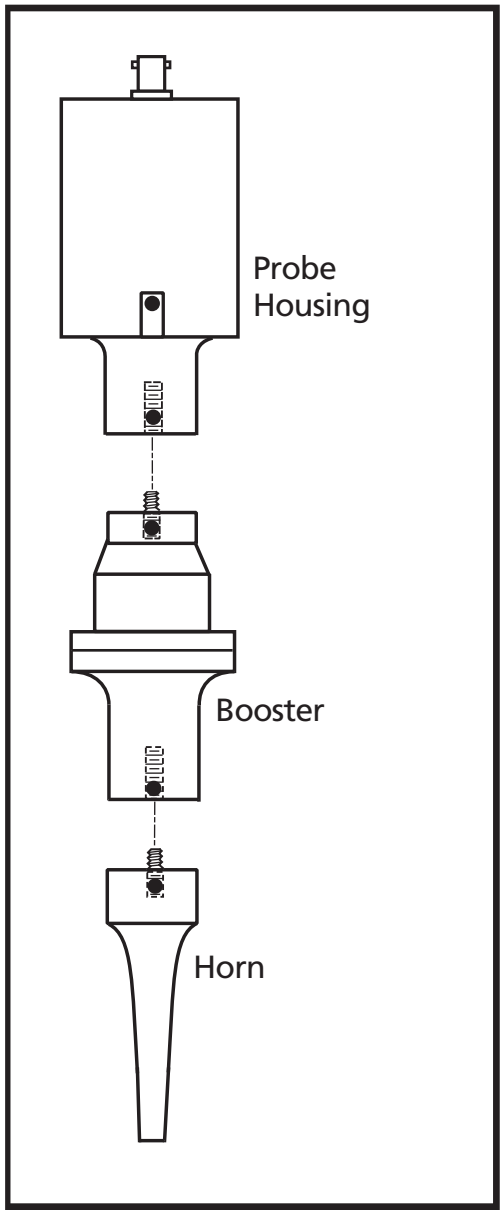


Figure 6–3 Probe, Booster and Horn

Stack Assembly

Attaching a Replaceable Tip to a Horn

1. Inspect all horn and tip surfaces for stress cracks, chips, or gouges. Any of these irregularities will affect operation and could lead to further equipment damage. Contact the Dukane Ultrasonics Tooling Department concerning damaged horn components.
2. Apply an extremely thin layer of a high temperature, high pressure silicon grease to the back surface that mates with the horn. The grease will allow both surfaces to intimately mate and become acoustically transparent which improves the energy transfer. Do not apply any grease to the threads. We recommend Dow–Corning #4 (or #111 as an alternate). A small packet of Dow–Corning #4 is supplied with the system. If you cannot use a silicon–based grease in your facility, a petroleum–based grease may be used. However, it is likely to leave carbonaceous deposits on the surface, and require more frequent joint maintenance. Failure to follow these instructions, may result in the mating surfaces bonding and difficulty removing the tip from the horn.
3. Thread the tip into the horn and tighten to the torque specifications below using an open end wrench of the correct size to fit the wrench flats of the tip. This is illustrated in Figure 6-4. If necessary, use a spanner wrench (on horns with spanner wrench holes) or an open end wrench (on horns with wrench flats) to keep the horn from turning in your hand. A canvas strap wrench is permissible if it does not gouge or scratch the horn.

Replaceable Tips to Horn

inch-lb	ft-lb	N-m	Size
360	30	40.7	1/2" x 20 tpi tip threads
336	28	38	3/8" x 24 tpi tip threads
300	25	33.9	5/16" x 24 tpi tip threads
240	20	27.1	1/4" x 28 tpi tip threads

Table 6-I Tip Torque Unit Conversions

NOTE

Do not apply any grease to the threads of the replaceable tip. This may cause the tip to loosen from the horn resulting in inconsistent operation.

CAUTION

NEVER clamp the horn in a vise. The resulting scratches or gouges in the surface are stress risers which may result in cracks.

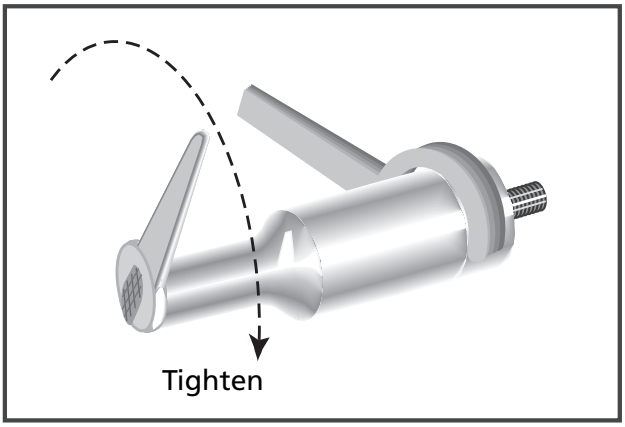


Figure 6–4 Replaceable Tip Installation

NOTE

Dukane Part No. for the 20kHz spanner wrenches is 721–68.

Dukane Part No. for the 40kHz spanner wrenches is 721–44.

Attaching the Mounting Stud to a Horn or a Booster

1. Inspect the stud for cracks or damaged threads. Replace the stud if it is cracked or otherwise damaged.
2. Remove any foreign matter from the threaded stud and the mating hole.
3. Thread the mounting stud into the input* end of the horn or the input* end of the booster and tighten to the following torque specifications using an Allen wrench in the socket head of the mounting stud. Table 6-II lists the torque specifications in units for both English and Metric systems of measurements.

   DO NOT hold the booster by the mounting rings when tightening stud. The mounting rings have a shear pin which could snap under excessive torque. Use a spanner wrench (on horns with spanner wrench holes) or an open end wrench (on horns with wrench flats) to keep the horn or booster from turning in your hand.

in-lb	ft-Lb	N-m	Size
12-18	1 - 1.5	1.4 - 2	1/2” x 20 tpi studs
12-18	1 - 1.5	1.4 - 2	3/8” X 20 tpi studs
12-18	1 - 1.5	1.4 - 2	8 mm studs

Table 6-II Stud Torque Unit Conversions

* Always assemble the mounting studs that mate boosters, transducers and horns to the input end of the horn or the input end of the booster first. This is shown in Figure 6-6.

NEVER thread a stud into the transducer or the output end of the booster first. See *Booster Notes* in this section for correctly identifying the output end of a booster.

NOTE

Do not apply any grease to the stud threads or the tapped hole. This may cause the stud to loosen. If the stud wanders within the joint, it can vibrate, resulting in excessive heat. In some cases, this can melt the tooling material.

NOTE

To convert inch-lbs to ft-lbs, divide by 12.
To convert inch-lbs to Nm, divide by 8.852.
To convert ft-lbs to Nm, multiply by 1.356.
To convert Nm to ft-lbs, multiply by 0.7376.

Torque specifications have a tolerance of about ± 10%.

Attaching The Horn to a Booster, Booster to a Probe, or Horn to a Probe

1. Inspect all surfaces to be joined for stress cracks, chips, or gouges. Any of these irregularities will affect operation and could lead to further equipment damage. Contact the Dukane Ultrasonic Tooling Department concerning a damaged booster.
2. Ensure that the mating surfaces of the two components are clean and smooth. These surfaces must make intimate contact for the mechanical energy to pass from one component to the next. Pitting or a buildup of old grease and dirt on a mating surface will interfere with the energy transfer and reduce the power delivered.
3. Make sure that the stud in the horn or booster is tight. See the preceding mounting stud assembly instructions for torque specifications.
4. Remove any foreign matter from the threaded stud and mating hole.
5. Apply an extremely thin layer of a high temperature, high pressure silicon grease to the surface that mates with the horn. The grease will allow both surfaces to intimately mate and become acoustically transparent which improves the energy transfer. We recommend Dow–Corning #4 (or #111 as an alternate). A small packet of Dow–Corning #4 is supplied with the system. If you cannot use a silicon–based grease in your facility, a petroleum–based grease may be used. However, it is likely to leave carbonaceous deposits on the surface, and require more frequent joint maintenance. Grease may be omitted if mylar washers are preferred on systems that require frequent changes. Mylar is plastic and will creep under compression, so mylar is not recommended for system that are not changed frequently. Failure to follow these instructions, may result in the mating surfaces bonding and difficulty removing the horn from the booster or the booster from the probe.

NOTE

Always remove a probe stack from the machine in which it is mounted before attaching or removing a horn.

CAUTION

Never leave a horn or booster assembly hand tight. Torque it to the proper specifications before proceeding. If the assembly is installed without being properly torqued down, the assembly may vibrate severely, damaging the mating surfaces and causing the generator to overload.

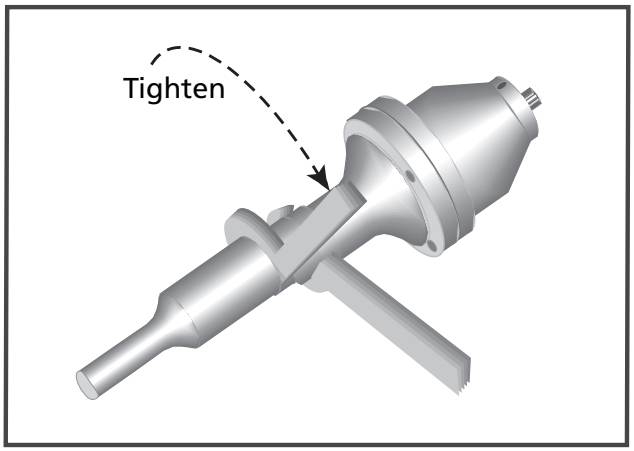


Figure 6–5 Stack Assembly Procedure

6. Thread the components together and tighten to the following torque specifications using only the correct size wrenches. Use spanner wrenches on components with spanner wrench holes or an open end wrench on components with wrench flats. See Figure 6–5 for the correct procedure. Refer to Table 6-III for torque unit conversions. Be careful not to overtighten.

In-lb	Ft-lb	N-m	kHz
540	45	61	15 kHz stack
420	35	47.5	20 kHz stack
216	18	24.4	30 kHz stack
216	18	24.4	40 kHz stack

Table 6-III Horn/Booster Torque Unit Conversions

NOTE

Horn and booster torque specifications are higher than stud torque specs. Be sure to tighten the horn or booster joints to the higher torque limits.

Do not tighten the studs to these higher ratings as it may induce unnecessary stress in the assembly.

Stack Disassembly

Stack disassembly is required when changing the booster or horn, or for a thorough inspection of all stack components. In mounted systems, always remove the stack from its mounting to disassemble the stack components.

To establish a maintenance schedule, inspect the mating surfaces after the first 200–400 hours of operation. If they require cleaning, halve the time between inspections. If the surfaces do not require reconditioning, then double the time between inspections. Each system is different due to the large number of operational parameters and stress factors.

The assembly and disassembly procedures for a hand probe are shown in Figure 6–6. It makes no difference whether the horn is attached to the booster first, or the booster is attached to the probe first.

CAUTION

Never hold a probe by the housing when tightening or loosening an adjoining component. The probe housing has anti–rotation devices to keep the transducer aligned. These could shear under excessive torque.

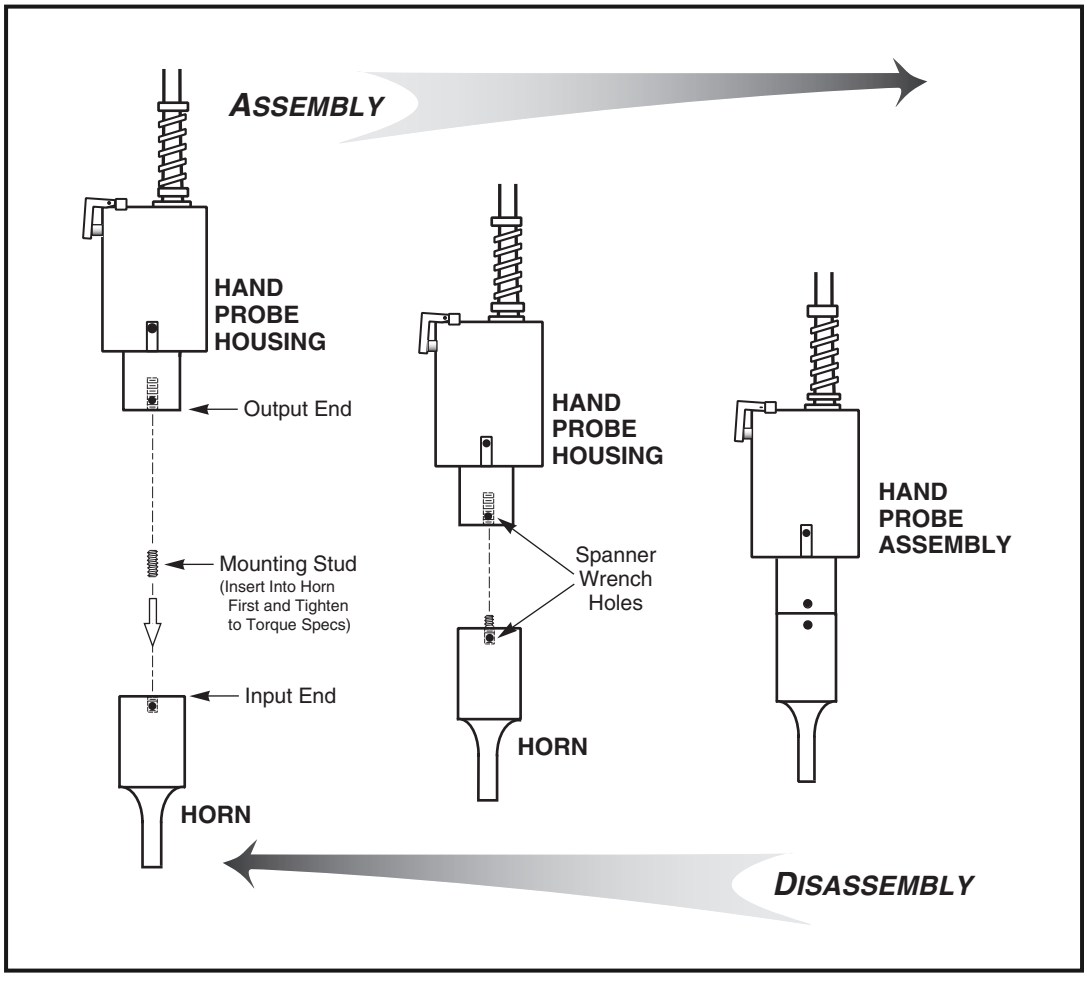


Figure 6–6 Hand Probe Assembly and Disassembly

Separating the Horn from a Booster, Booster from a Probe or Horn from a Probe

On all transducers and horns with spanner wrench holes, use only the correct size spanner wrench that came with your system to provide sufficient torque to loosen a joint. See Figure 6–7.

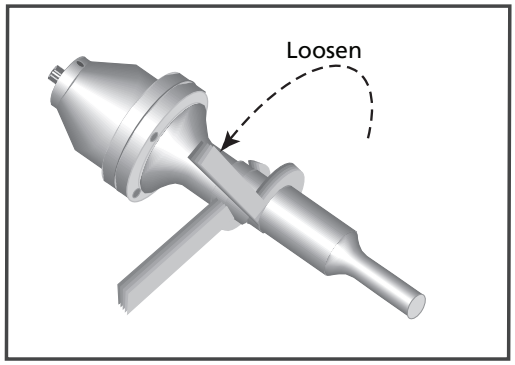


Figure 6–7 Separating the Horn from the Booster

On boosters and horns with wrench flats, use only the correct size wrench to provide sufficient torque to loosen a joint when necessary.

Removing the Mounting Stud from a Horn or Booster

Only use an allen wrench of the correct size in the socket head's stud to remove the stud from the horn or booster.

Removing Replaceable Tips from a Horn

Use an open end wrench of the correct size to fit the wrench flats of the detachable tip. Use a spanner wrench (on horns with spanner wrench holes) or an open wrench (on horns with wrench flats) to provide an opposite force to keep the horn from turning in your hand. Refer to Figure 6–8 for the correct tip removal procedure.

NOTE

Do not hold a booster by the mounting rings when removing the stud from the booster. Use a spanner or open–end wrench to provide opposite force and keep the horn or booster from turning in your hand when loosening the stud. Use a spanner wrench on horns and boosters with spanner wrench holes. Use an open end wrench on horns and boosters with wrench flats.

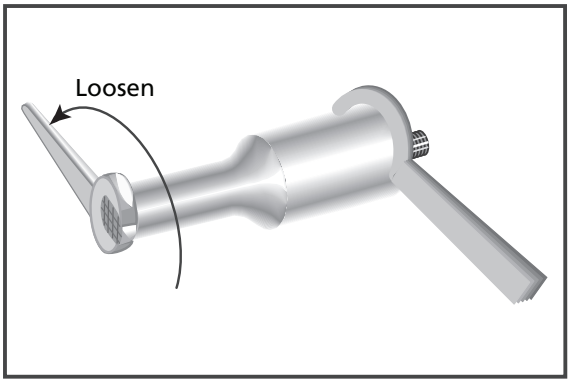


Figure 6–8 Removing a Replaceable Tip from the Horn

Booster Notes

How to Tell the Booster Input End from the Output

1. The depth of the threaded hole on the output end is always deeper than the threaded hole on the input end.
2. On an amplifying booster (gain > 1.0), the larger diameter end is the input end. On a reducing booster (gain < 1.0) the larger diameter end is the output end. On a neutral acting booster the diameters are equal.
3. The cap screws on the booster mounting rings are always inserted from the output end toward the input end.

How to Tell if the Booster Is Amplifying or Reducing

Boosters have a die-stamped number on their surface that indicates their gain or reduction. If the number is greater than 1.0 (e.g. 1.5), it is an amplifying booster. If the number is less than 1.0 (e.g. 0.6), it is a reducing or reverse booster. A neutral booster has no gain and has 1.0 stamped on it. A neutral or coupling booster is used to provide another probe stack clamping location for added stability.

CAUTION

NEVER install a booster upside down to change an amplifying system to a reducing system. The boosters are dimensionally asymmetric. They are tuned from input to output to act like an acoustic lens. Reversing them will not give the expected results and may cause damage to the system.

SECTION 7

Troubleshooting

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No Ultrasonic Output

Probe

Make sure that the hand probe cable is connected to the generator connector (HAND PROBE) and secured to the rear panel. Also, make sure the hand probe stack is properly assembled.

System Power Output Level

Overload

When an overload occurs, it will automatically reset when the next ultrasound activation signal begins. If the condition persists:

Turn the generator OFF and:

1. Check the system. Change the hand probe to one that is known to be good.
2. Turn the generator ON, and see if the fault condition has been corrected.

NOTE

The LCD screen displays a variety of pop-up status changes as they occur. Check Tables 7-I and 7-II - Pop-up Fault Status Screens - Pages 49- 50.

Overtemperature

When the system overheats, and the generator's internal temperature exceeds 85° C (185° F) an overtemperature fault condition will trip.

When the system cools, the system automatically resets the overtemperature fault.

NOTE

When Latching Faults is enabled, ENTER must be pressed to clear a fault.

Generator Fault Does Not Reset

When a system fault condition does not automatically reset, the generator needs servicing.

System Power Diagnostic Procedures

The only fault indications available with these probe systems are the ones shown on the LCD display.

Welding Problems

Weak Welds

Weak welds, or underwelding, is caused by insufficient energy being transmitted to the part. You can increase the weld pressure, increase the weld duration (Time or Energy) or change to a higher gain booster to increase the amplitude to increase the energy delivered to the weld.

Inconsistent Welds

Variations in plastic due to filler materials and moisture absorption may lead to inconsistent welds. Fillers can be especially troublesome if they are not uniformly distributed, the content is too high or it contains too much or poor quality regrind or degraded plastic.

Try welding by energy. This eliminates many inconsistencies.There should be no unusual or loud noise from the acoustic stack. If there is, disassemble the stack and reassemble.

Exchange the probe with another unit to see if the problem disappears. If not, exchange the generator with another unit to try and isolate the problem.

The horn amplitude may not be uniform if it has been machined, altered or damaged. All of these will change the resonant frequency of the horn. You can have the horn analyzed.

NOTE

Primary factors in achieving consistent, quality welds - especially when using hand held probes - are the skill and training of the operator.

Pop-up Fault Status Screens

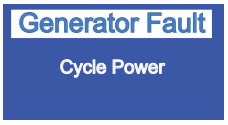
Generator Fault Status Screens - Manual Mode	
Status Text Displayed	**System Status or Fault Explanation**
	An Average Overload fault tripped. Output power exceeded rated wattage. Lower the welding pressure or amplitude. Fault will reset when next weld cycle starts.
	A Positive Peak Overload fault tripped. Peak IGBT transistor current exceeded. Caused by a severe frequency mis-match. Fault will reset when next weld cycle starts.
	Resonant frequency lock not found, or lost. Check for a defective stack component. Check for stack coupling to the fixture. Fault will reset when next weld cycle starts.
	System Overtemperature fault detected. Fault will reset when system cools down.
	Internal communications error. Turn generator power off and back on. Call Dukane service if the fault persists.

Table 7- I Pop-Up Fault Status Screens - Manual Mode

Continued

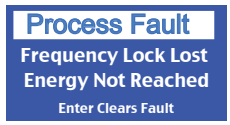
Process Fault Status Screens - Time and Energy Modes		
Status Text Displayed		**System Status or Fault Explanation**
Latch On Fault ENABLED	**Latch On Fault DISABLED**	
		*Set Weld Time Not Reached*, **or** *Set Weld Energy Not Reached* - appears if the weld ends before the set time or energy is reached (respectively) due to operator error, **or** because the weld was intentionally aborted.
		
		*Peak Overload, Average Overload, Frequency Lock Lost, Input Undervoltage,* or *Over Temperature* is displayed in place of *Set Weld Time not Reached*, or *Set Weld Energy not Reached*, if the weld ends before the set time or energy is reached due to a process or generator fault.
		
		

Table 7-II Pop-Up Fault Status Screens - Time and Energy Modes

SECTION 8

Options

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iQ Hand Probe Options

Buzzer Kit (Part No. 438-971)

In some noisy environments the built-in buzzer can not easily be heard. This buzzer kit is designed for those conditions, and it suits the customer that prefers not to provide their own buzzer (using the status outputs of the generator).
The kit adds a 100dB buzzer inside the generator.

Foot Switch Kit (Part No. 438-976)

This kit allows the customer to add their own external foot switch to replace the trigger on the hand probe.

An external breakout box with cabling is supplied. The box connects to the generator and to the hand probe.

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SECTION 9
Specifications

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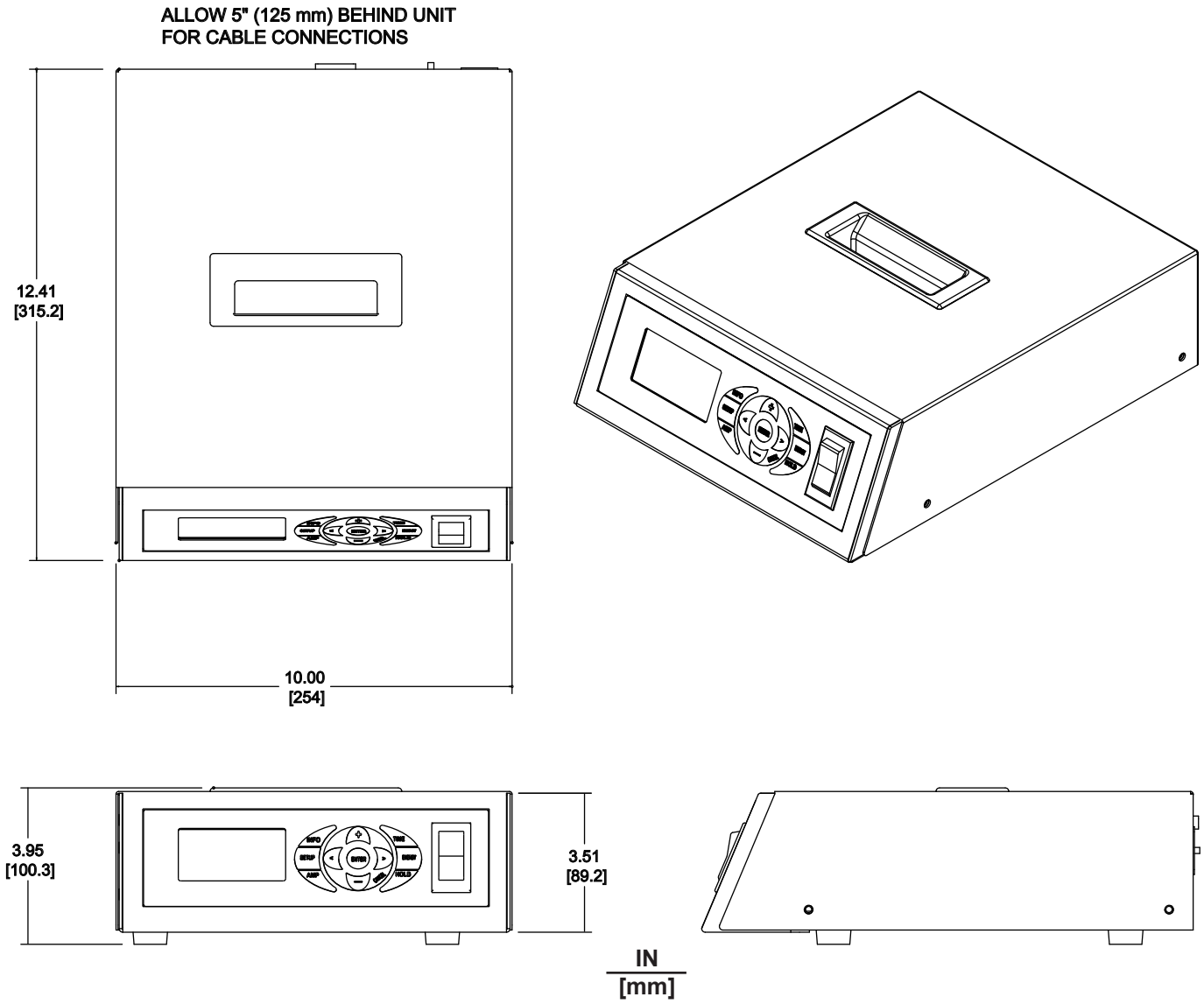
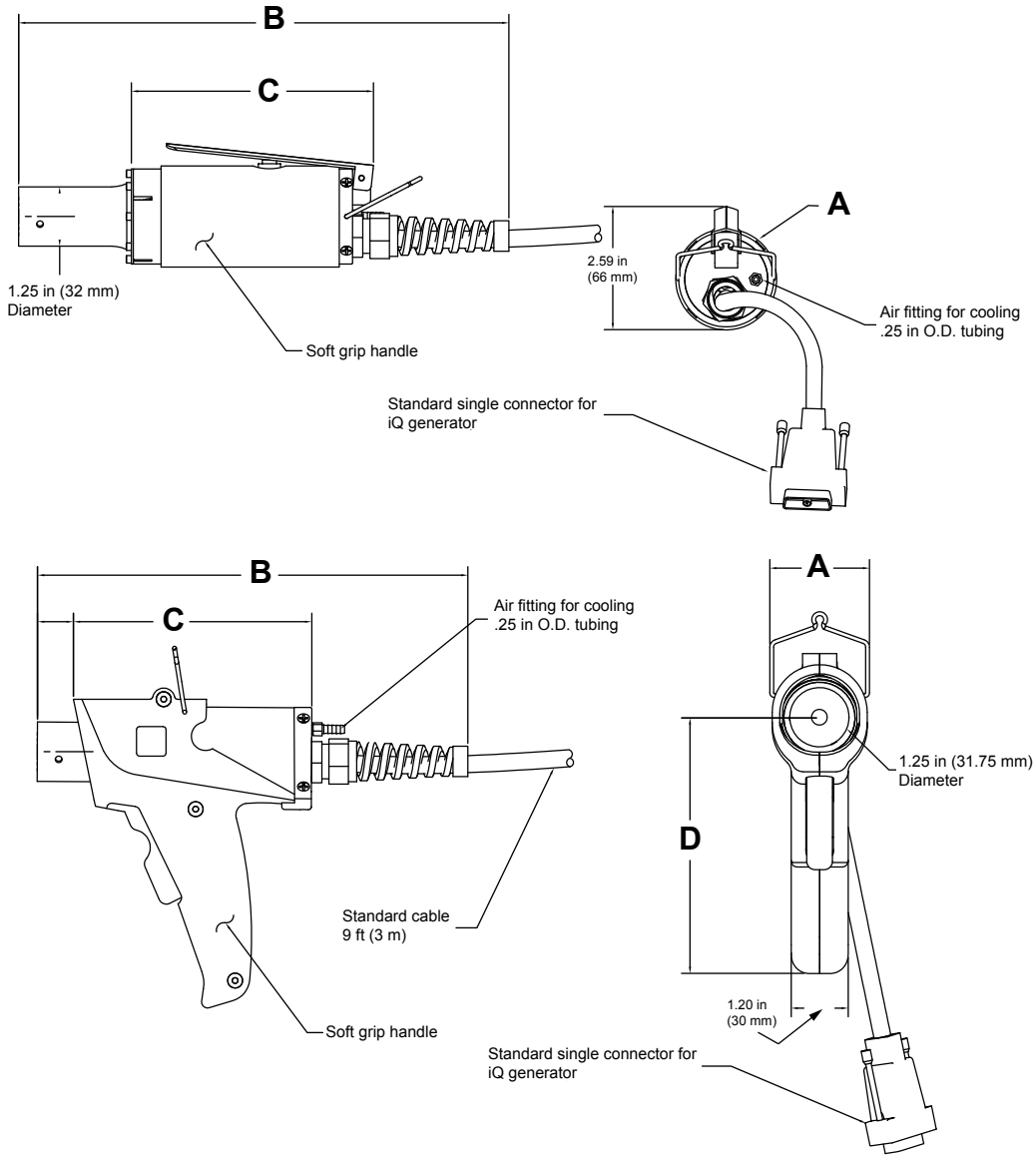


Figure 9-1 Generator Outline Drawing



System Model Number	Generator Model Number	Probe Part Number	Probe Weight lb (kg)	A Diameter in (mm)	B Length w/Strain Relief in (mm)	C Body Length in (mm)	D Handle Length in (mm)	Probe Cable Length
HP 2.61-P	20HP060-1E	41PG20S	1.80 (.82)	1.90 (48)	8.75 (222)	5.10 (130)	5.38 (137)	9 ft (3 m)
HP 2.61-H	20HP060-1E	41HP20S	1.60 (.73)		10.00 (254)	5.02 (129)		
HP 2.62-P	20HP060-2E	41PG20S	1.80 (.82)		8.75 (222)	5.10 (130)	5.38 (137)	
HP 2.62-H	20HP060-2E	41HP20S	1.60 (.73)		10.00 (254)	5.02 (129)		
HP 3.61-H	30HP060-1E	41HP30S	1.40 (.64)		9.00 (229)	5.10 (130)		
HP 3.62-H	30HP060-2E	41HP30S						
HP 4.61-P	40HP060-1E	41PG40S	1.65 (.75)	2.10 (53)	7.75 (197)	5.02 (129)	5.38 (137)	
HP 4.61-H	40HP060-1E	41HP40S	1.35 (.61)	1.90 (48)		4.80 (122)		
HP 4.62-P	40HP060-2E	41PG40S	1.65 (.75)	2.10 (53)		5.02 (129)	5.38 (137)	
HP 4.62-H	40HP060-2E	41HP40S	1.35 (.61)	1.90 (48)		4.80 (122)		

Figure 9-2 Probes Outline Drawings and Dimensions

Weights

Generator:	12 pounds (5.44 kg)
Probes:	Please see the table on the previous page.
Shipping:	Add 5 pounds (2.27 kg) to unit weight for packing materials.

Operating Environment

Operate the equipment within these guidelines:

Temperature:	40°F to 100°F (+5°C to +38°C)
Air Particulates:	Keep the equipment dry. Minimize exposure to moisture, dust, dirt, smoke and mold.
Humidity:	5% to 95% non–condensing @ +5°C to +30°C

Nonoperating storage guidelines:

Temperature:	- 4°F to 158°F (-20°C to +70°C)
Air Particulates:	Keep the equipment dry. Minimize exposure to moisture, dust, dirt, smoke and mold.
Humidity:	5% to 95% non–condensing @ 0°C to +30°C

AC Power Requirements

Operating Frequency	System Model Number	Generator Model Number	Probe Part Number	Overload Power Rating (Watts)	Input AC Power Requirements Nominal AC Volt	North America/ Japan AC Outlet Rating
20kHz	HP 2.61-P	20HP060-1E	41PG20S	600	100-120 VAC, 50/60 Hz @ 9.0 Amps	15.0 Amps
20kHz	HP 2.61-H	20HP060-1E	41HP20S		100-120 VAC, 50/60 Hz @ 9.0 Amps	
20kHz	HP 2.62-P	20HP060-2E	41PG20S		200-240 VAC, 50/60 Hz @ 4.5 Amps	
20kHz	HP 2.62-H	20HP060-2E	41HP20S		200-240 VAC, 50/60 Hz @ 4.5 Amps	
30kHz	HP 3.61-H	30HP060-1E	41HP30S		100-120 VAC, 50/60 Hz @ 9.0 Amps	
30kHz	HP 3.62-H	30HP060-2E	41HP30S		200-240 VAC, 50/60 Hz @ 4.5 Amps	
40kHz	HP 4.61-P	40HP060-1E	41PG40S		100-120 VAC, 50/60 Hz @ 9.0 Amps	
40kHz	HP 4.61-H	40HP060-1E	41HP40S		100-120 VAC, 50/60 Hz @ 9.0 Amps	
40kHz	HP 4.62-P	40HP060-2E	41PG40S		200-240 VAC, 50/60 Hz @ 4.5 Amps	
40kHz	HP 4.62-H	40HP060-2E	41HP40S		200-240 VAC, 50/60 Hz @ 4.5 Amps	

Table 9-I AC Power Requirements

Regulatory Agency Compliance

FCC

The generator complies with the following Federal Communications Commission regulations.

- The limits for FCC measurement procedure MP-5, "Methods of Measurement of Radio Noise Emissions from ISM Equipment", pursuant to FCC Title 47 Part 18 for Ultrasonic Equipment.

CE Marking

This mark on your equipment certifies that it meets the requirements of the EU (European Union) concerning interference causing equipment regulations. CE stands for Conformité Europeéne (European Conformity). The generator complies with the following CE requirements.

- The EMC Directive 2004/108/EC for Heavy Industrial —
  EN 61000-6-4: 2001
  EN 55011: 2003
  EN 61000-6-2: 2001
  EN61000–4–2
  EN61000–4–3
  EN61000–4–4
  EN61000–4–5
  EN61000–4–6
  EN61000–4–8
  EN61000–4–11
- The Low Voltage Directive 2006/95/EC.
- The Machine Directive 98/37/EC.
  EN 60204-1: 2006
  Safety of Machinery - Electrical Equipment of Machines Part 1: Specification for General Requirements.

Effective 12/29/09:
The Machinery Directive 2006/42/EC.
EN 60204: 2006
Safety of Machinery - Electrical Equipment of Machines Part 1: General Requirements.

CAUTION

DO NOT make any modifications to the generator or associated cables as the changes may result in violating one or more regulations under which this equipment is manufactured.

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SECTION 10

Outputs Interface

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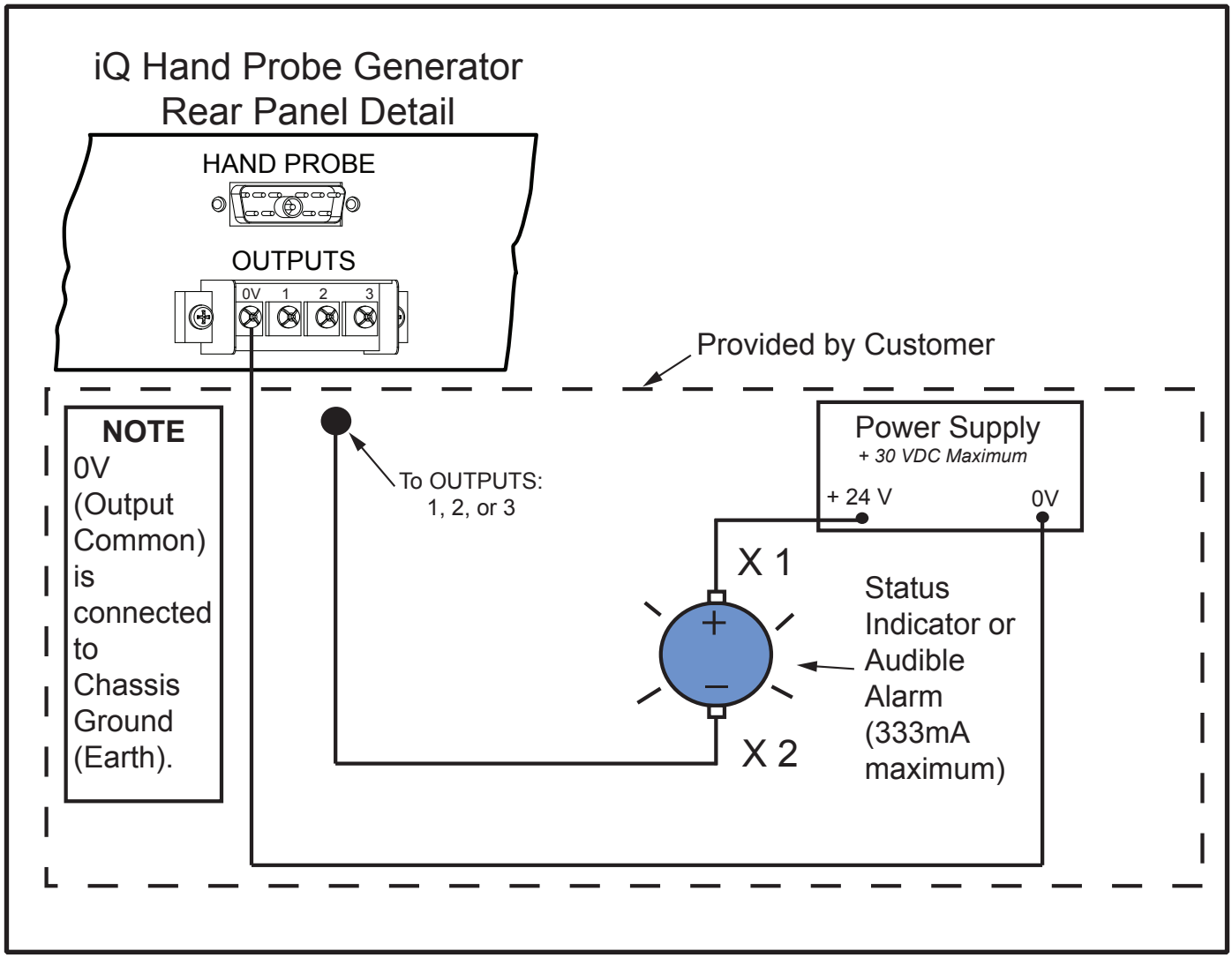

Figure 10-1 OUTPUTS Connection Example

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SECTION 11

Contacting Dukane

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Contacting Dukane

Identify Equipment

When contacting Dukane about a service–related problem, be prepared to give the following information:

- Model number, line voltage and serial number
- Fault/error indicators from the LCD display
- Software version (Press **INFO**. With pointer at **System Information**, press **ENTER** to get this data.)
- Problem description and steps taken to resolve it

Many problems can be solved over the telephone, so it is best to call from a telephone located near the equipment.

Intelligent Assembly Solutions

Mailing Address: Dukane Ultrasonics
2900 Dukane Drive
St. Charles, IL 60174 USA

Phone: (630) 797–4900

Fax:

Main (630) 797–4949

Service & Parts (630) 584–0796

Website

The website has information about our products, processes, solutions, and technical data. Downloads are available for many kinds of literature.

Here is the address for the main website:

www.dukane.com/us/

You can locate your local representative at:

www.dukane.com/us/sales/intsales.htm

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APPENDICES

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List of Figures

List of Figures *continued*

List of Tables

Dukane ISO

ISO CERTIFICATION

Dukane chose to become ISO 9001:2000 certified in order to demonstrate to our customers our continuing commitment to being a quality vendor. By passing its audit, Dukane can assure you that we have in place a well–defined and systematic approach to quality design, manufacturing, delivery and service. This certificate reinforces Dukane's status as a quality vendor of technology and products.

To achieve ISO 9001:2000 certification, you must prove to one of the quality system registrar groups that you meet three requirements:

1. Leadership
2. Involvement
3. Quality in Line Organizations and Quality System Infrastructure.

The ISO 9001:2000 standard establishes a minimum requirement for these requirements and starts transitioning the company from a traditional inspection–oriented quality system to one based on partnership for continuous improvement. This concept is key in that Dukane no longer focuses on inspection, but on individual processes.

Dukane's quality management system is based on the following three objectives:

1. Customer oriented quality. The aim is to improve customer satisfaction.
2. Quality is determined by people. The aim is to improve the internal organization and cooperation between staff members.
3. Quality is a continuous improvement. The aim is to continuously improve the internal organization and the competitive position.

ISO 9001:2000
CERTIFIED

Dukane products are manufactured in ISO registered facilities

Please refer to our website at:

www.dukane.com/us/sales/intsales.htm

to locate your local representative.

Dukane Intelligent Assembly Solutions • 2900 Dukane Drive St. • Charles, Illinois 60174 USA • TEL (630) 797-4900 • FAX (630) 797-4949